Plenary Session

41st Annual Salmonid Restoration Conference held in
Santa Rosa, California from March 26-29, 2024

Master of Ceremonies: Thomas Williams, Ph.D., *NOAA Fisheries*

Presentations

- No Slides, **Through the Evolution of Language, We Weave a Narrative for the Future**, Armando Quintero, *Director, California State Parks*
- Slide 4, **Making the Most of Opportunities for Salmon Recovery in a Warming World**, Jennifer Quan, *Regional Administrator, NOAA Fisheries West Coast Region and* Kristen Koch, *Director, SWFSC, NOAA Fisheries*
- No slides, **The Cultural and Environmental Significance of the Klamath Dam Removal**, Michael Belchik, *Senior Biologist, Yurok Tribe Fisheries Department* and Mark Bransom, *CEO*, *Klamath River Renewal Corporation*
- Slide 21, **Healthy Rivers, Healthy Communities: How River Conservation Heals Climate**
- **Change, Biodiversity Loss, and Environmental Injustice**, Ann Willis, Ph.D., *California Regional Director, American Rivers*

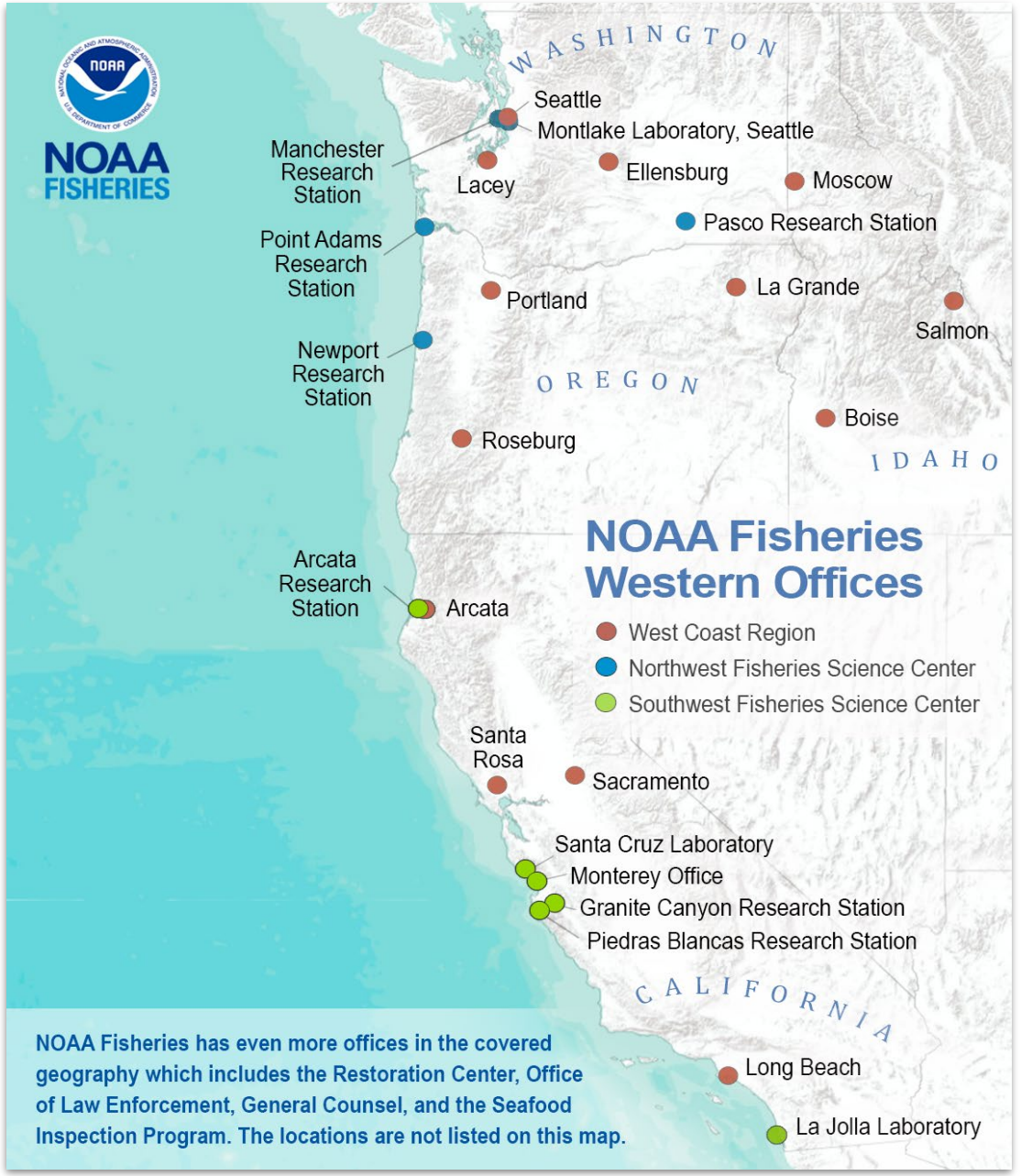
Salmon Recovery in a Warming World

Jennifer Quan, Regional Administrator
NOAA Fisheries West Coast Region

Kristen Koch, Director
Southwest Fisheries Science Center

Salmon Restoration Federation Conference **March 28, 2024**

- West Coast Region
- Science Centers
- Restoration Centers



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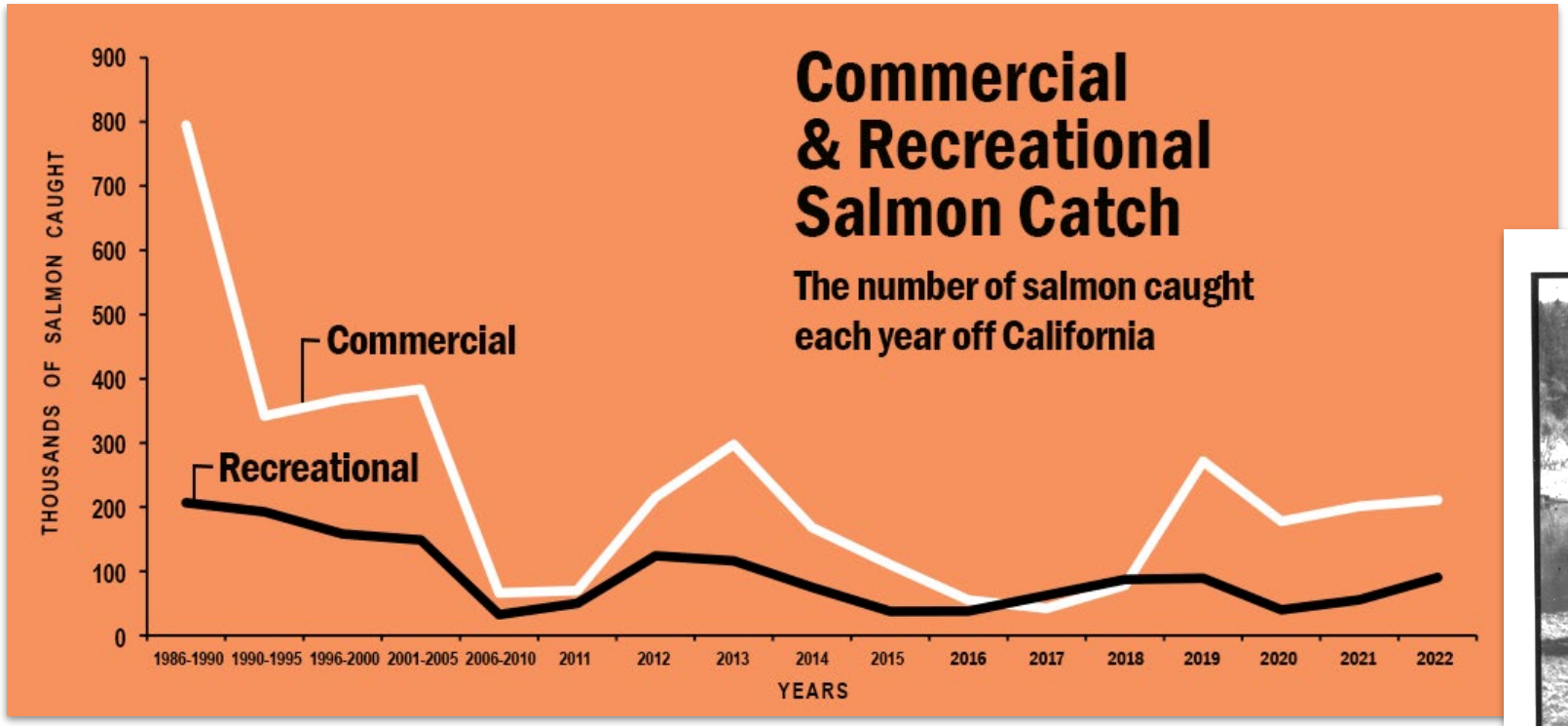
The Salmon and People Connection



Palmquist Collection, Cal Poly Humboldt University Library.

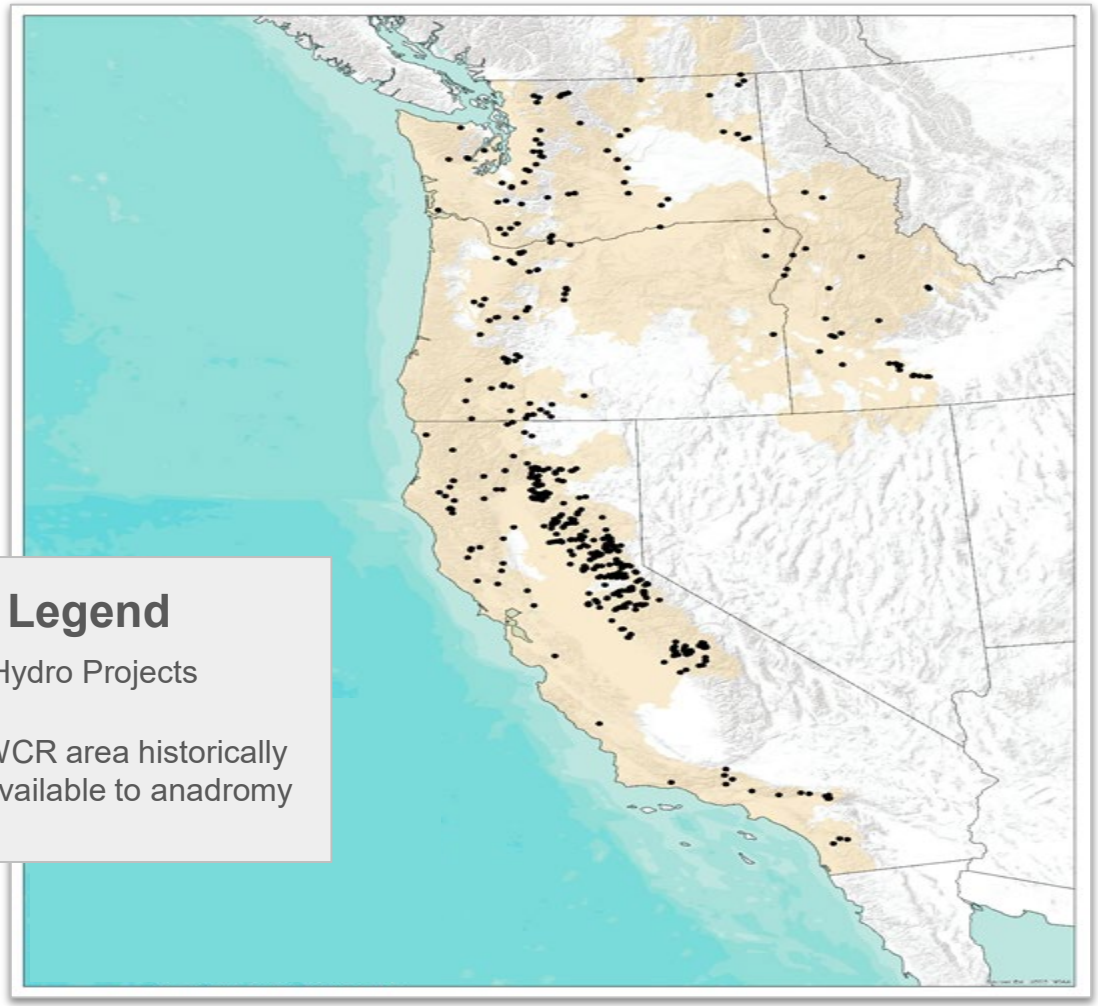
California fishing vessels landing salmon

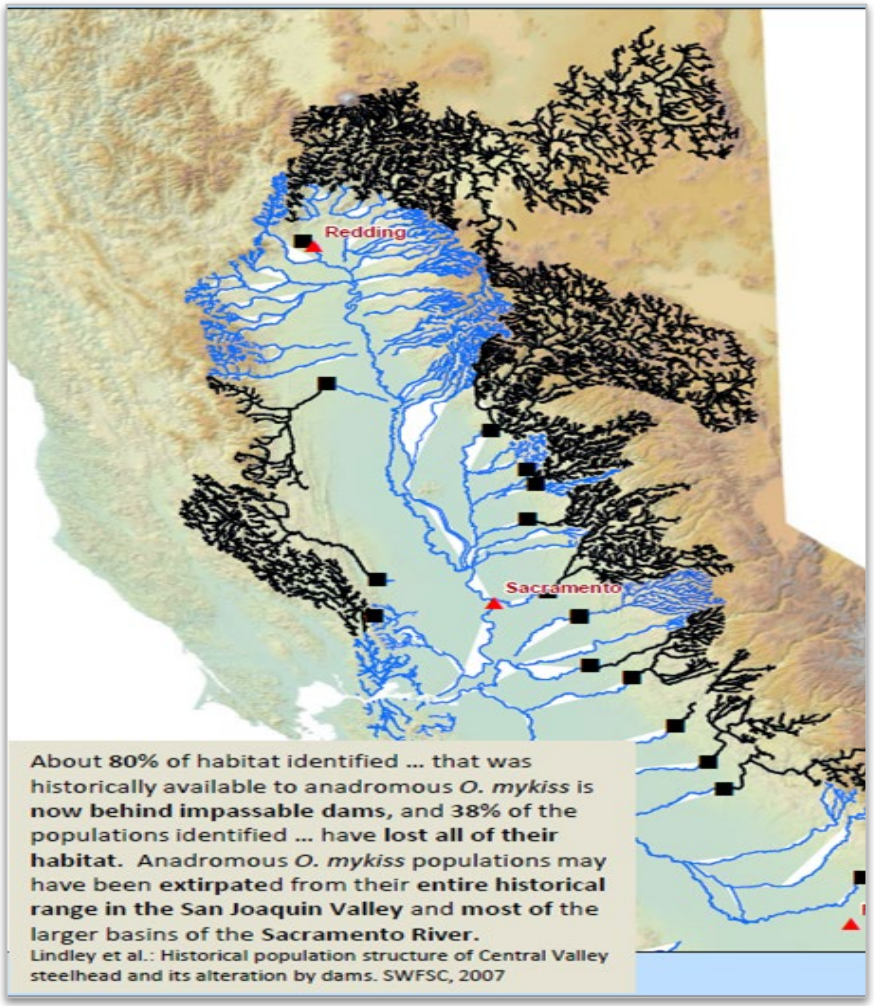
1980: 4,315 2022: 464

Partnerships to Address Climate Change

NOAA FISHERIES

Opportunities to recover salmon and steelhead





CA Central Valley Recovery Challenge

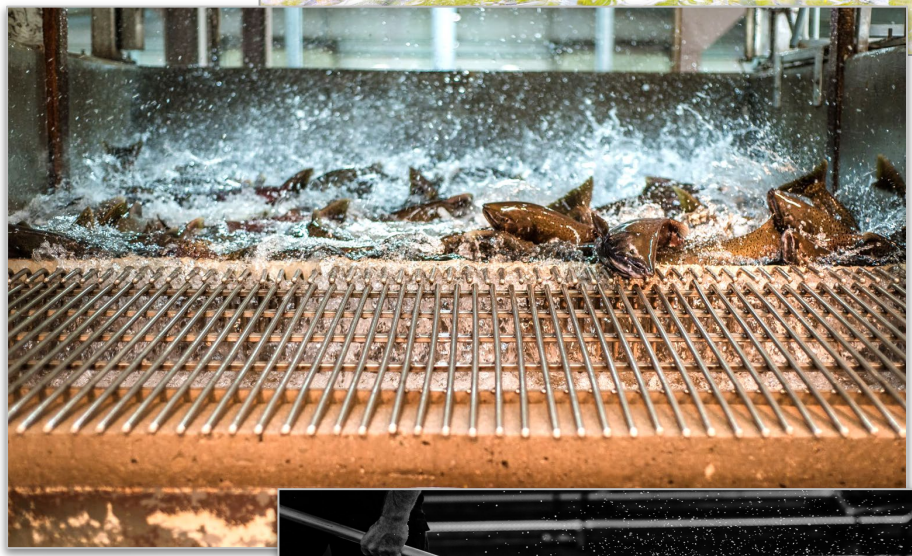
Fish passage around Daguerre Point Dam

Returning endangered winter-run Chinook to the McCloud River with Winnemem Wintu Tribe

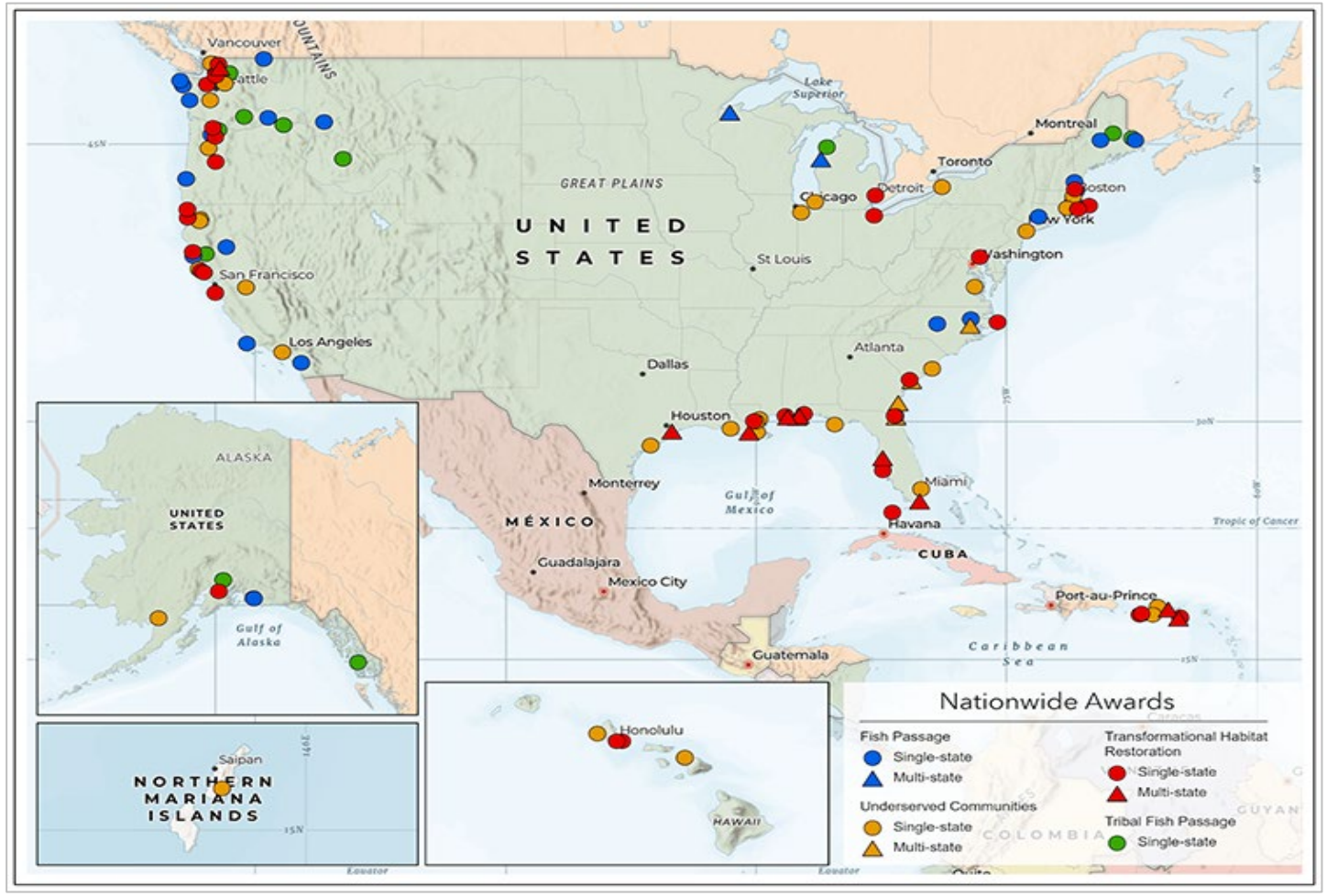
Marine Corps Base Camp Pendleton
So Cal Steelhead Passage 2019 - Santa Margarita River

Conservation Hatcheries

- HSRG guidance/performance targets for
  - Broodstock: source, collection, composition
  - Program: Operations, size, mating protocols, release strategies
  - Monitoring: Disease, health, genetics, response and validation
- Hatchery Genetic Management Plans (HGMP's)
  - Operations and performance targets
  - Required monitoring
- Salmon recovery and reintroduction
- Role of hatcheries in climate change



Bipartisan Infrastructure Law (BIL)



First awards

$1.5 Billion Habitat Restoration

- Pacific Coastal Salmon Recovery Fund
- Community Based Restoration

NMFS $1.2Billion Inflation Reduction Act (IRA)

Expand and Modernize Stock Assessments	Data Acquisition and Management	$145M
	Climate, Ecosystems, & Fisheries Initiative	$40M
Region-Specific Fisheries and Protected Resources	***Pacific Salmon***	**$42M**
	Regional Fisheries Management Councils	**$20M**
	North Atlantic Right Whale	$82M
	Red Snapper	$20M
Tribal Fish Hatcheries	***Mitchell Act Hatcheries***	**$60M**
	Non-Mitchell Act Hatcheries	**$240M**
Habitat Restoration and Fish Passage		$484M
Arctic Research		$2.9M
Efficient Permitting		$15.5M
Facilities		**$95M**

https://www.fisheries.noaa.gov/national/climate/helping-america-prepare-and-respond-climate-change-under-inflation-reduction-act

Region-Specific Initiative: Pacific Salmon ($42M)

Pacific Salmon IRA Funds: $42M Total ($15M WCR, $16.2M NWFSC, $10.8M SWFSC)			
Salmon Habitat Restoration	**Pacific Coastal Salmon Recovery Fund (PCSRF)**	Salmon habitat restoration and reconnection actions by State and Tribal partners	$15M
West Coast Salmon Science and Research	**Restoration, Reintroduction, and Recovery Techniques**	Present and future habitat quality, reintroduction effectiveness, adaptive capacity of salmonids	$6M
	Habitat Stressors in Freshwater and Estuary Environments	Urban stormwater effects, resilience under climate change, habitat stressors	$3M
	Ocean and Nearshore Ecology	Indicators of marine survival, predation rates, coastal ecology, lower trophic level energetics	$7M
	Integrated Model Development and Application	Life cycle model development, generalized models, integrative modeling, recovery strategy evaluation	$8M
	Cross-project support	FTE labor, supplies & equipment, and travel across projects and research themes	$3M

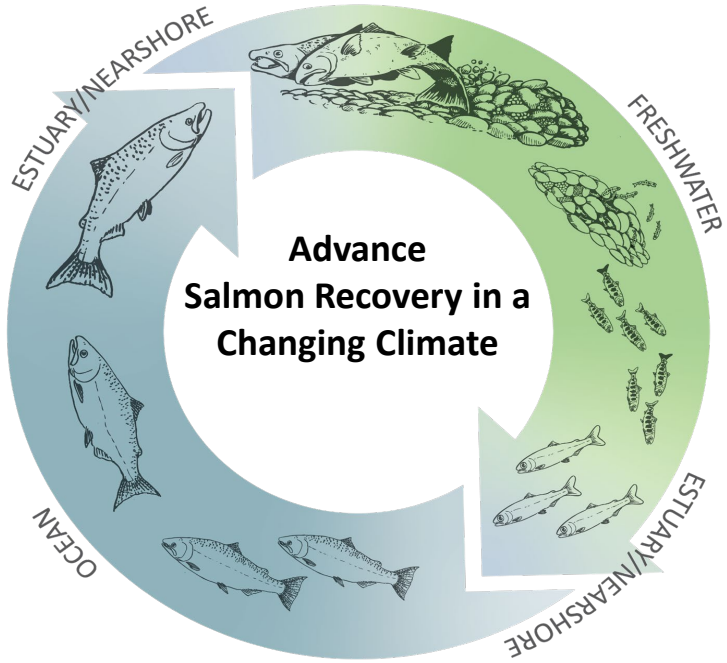
IRA Pacific Salmon Science Themes ($27M of $42M)

Integrated Model Development and Application

- Improved confidence in management decisions supported by LCMs
- A widely-used generalized life cycle modeling tool
- Robust recovery strategy evaluations
- Modeling tools transferable to multiple salmon species
- ESU-specific recovery scenarios including environmental flows, reintroduction above dams, and hatchery outplanting

Ocean and Nearshore Ecology

- Ocean productivity indicators that improve predictions of salmon survival and growth.
- Quantification of pinniped and avian predation rates.
- New indicators of primary production and lower trophic level energetics that improve ecosystem assessments.
- Improved understanding of potential long-term changes to salmon habitat in the California Current



Restoration, Reintroduction, and Recovery Techniques

- Science-based indicators and habitat valuation tools used to make meaningful conservation and management decisions
- Information shared with partner organizations thru a web-based dashboard
- Strategies to enhance success of reintroductions and improve conservation and traditional hatcheries for long term benefit of listed species
- Genetic analyses to determine adaptive capacity of Chinook salmon, steelhead, and coho populations

Habitat Stressors in Freshwater and Estuary Environments

- Use of toxicity data in salmon management decisions
- Thresholds for stormwater toxicity and thiamine deficiency across salmonid life stages and species
- New analytical techniques for measuring stormwater contaminants

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Restoration, Reintroduction, and Recovery Techniques ($6M)

Goal: Build the understanding and tools needed to make decisions related to salmon habitat and hatcheries as the climate changes.

Expected Impact: Science-based indicators that facilitate sound conservation and management decisions; Strategies to enhance success of reintroductions and improve conservation and traditional hatcheries; More informed hatchery management plans.

Planned Funding FY23 - FY26	
SWFSC	NWFSC
$1.5	$4.5M

Habitat Stressors in Freshwater and Estuary Environments ($3M)

Goal: Improved understanding of water quality threats to salmon in freshwater and estuarine habitats. Expanded use of water quality data in salmon management decisions.

Expected Impact: Use of toxicity thresholds in salmon management decisions; Better understanding of the impacts of combined habitat stressors (e.g., thiamine deficiency, elevated water temperature) on salmon.

Planned Funding FY23 - FY26	
SWFSC	NWFSC
$1.4	$1.6M

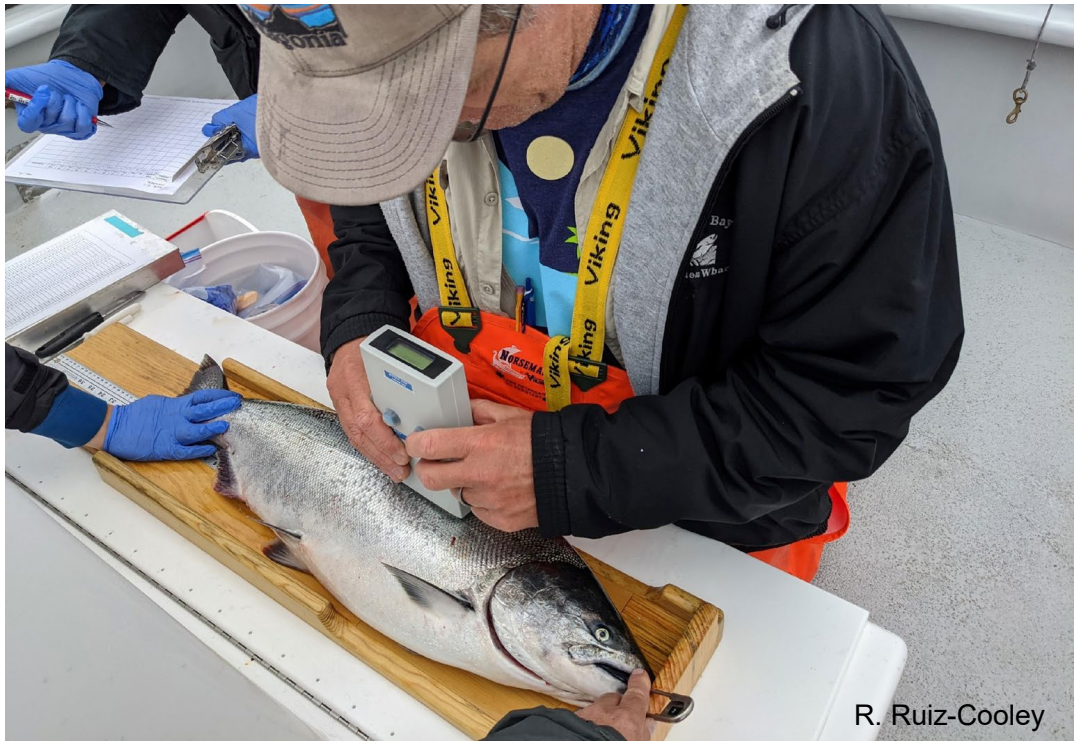
Ocean and Nearshore Ecology ($7M)

Goal: Provide more accurate measurements of ocean conditions, linkages between habitat conditions and salmon health, and predation rates of out-migrating salmonids. Updated data will improve model accuracy and confidence in management decisions.

Expected Impact: Ocean productivity indicators that improve predictions of salmon survival and growth; Quantification of pinniped and avian predation rates will improve salmon abundance predictions; New indicators of primary production and lower trophic level energetics that improve ecosystem assessments.


T. H. Williams

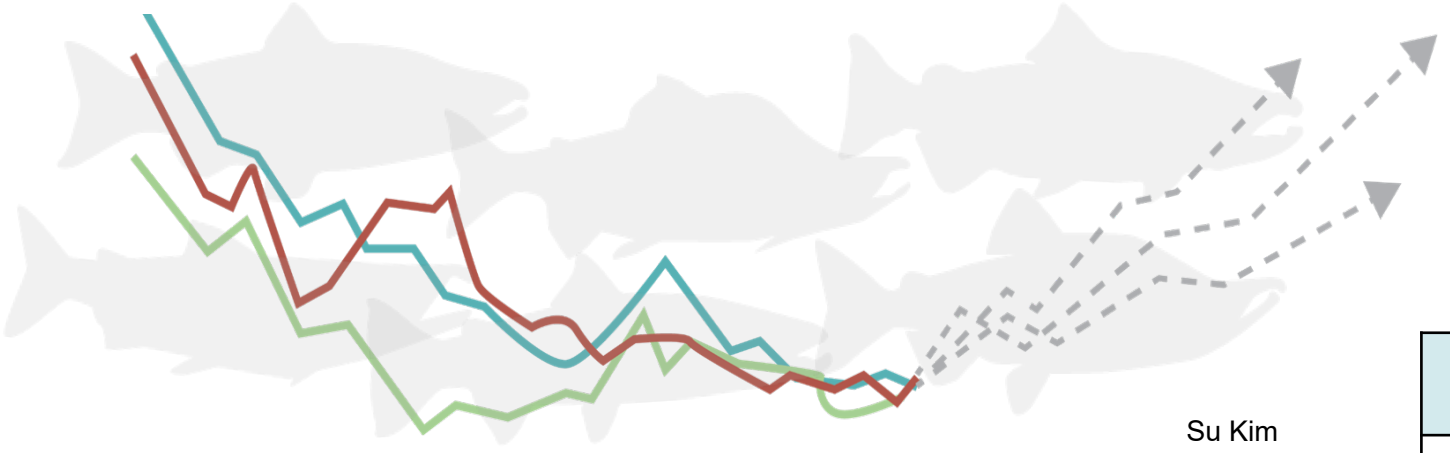
Planned Funding FY23 - FY26	
SWFSC	NWFSC
$2.3	$4.7M


R. Ruiz-Cooley

Integrated Model Development and Application ($8M)

Goal: Develop a generalized modeling framework and transferable model structure that will help us understand environmental interactions and alternative management strategies.

Expected Impacts: Improved confidence in management decisions supported by life-cycle models; Robust recovery strategy evaluations; Population viability analyses under climate change scenarios; Modeling tools transferable to multiple salmon species and for use by Tribal, state, and federal managers.



Su Kim

Planned Funding FY23 - FY26	
SWFSC	NWFSC
$3.2	$4.8M

Major Initiative, In a Nutshell

We're using the Pacific Salmon IRA funds to advance:

- Science that puts salmon and their recovery in the context of their ecosystem
  - food web
  - chemical milieu (natural, cultural, and social surroundings)
  - habitats they find themselves in
  - climate status
  - intersections with people, including tribal peoples
- New and existing analytical tools that
  - integrate, *in repeatable ways*, data and information
  - deliver output that can feed into management systems
  - help managers make hard decisions

NOAA FISHERIES

Healthy Rivers, Healthy Communities

Ann Willis, PhD
California Regional Director
March 28, 2024

AMERICAN RIVERS

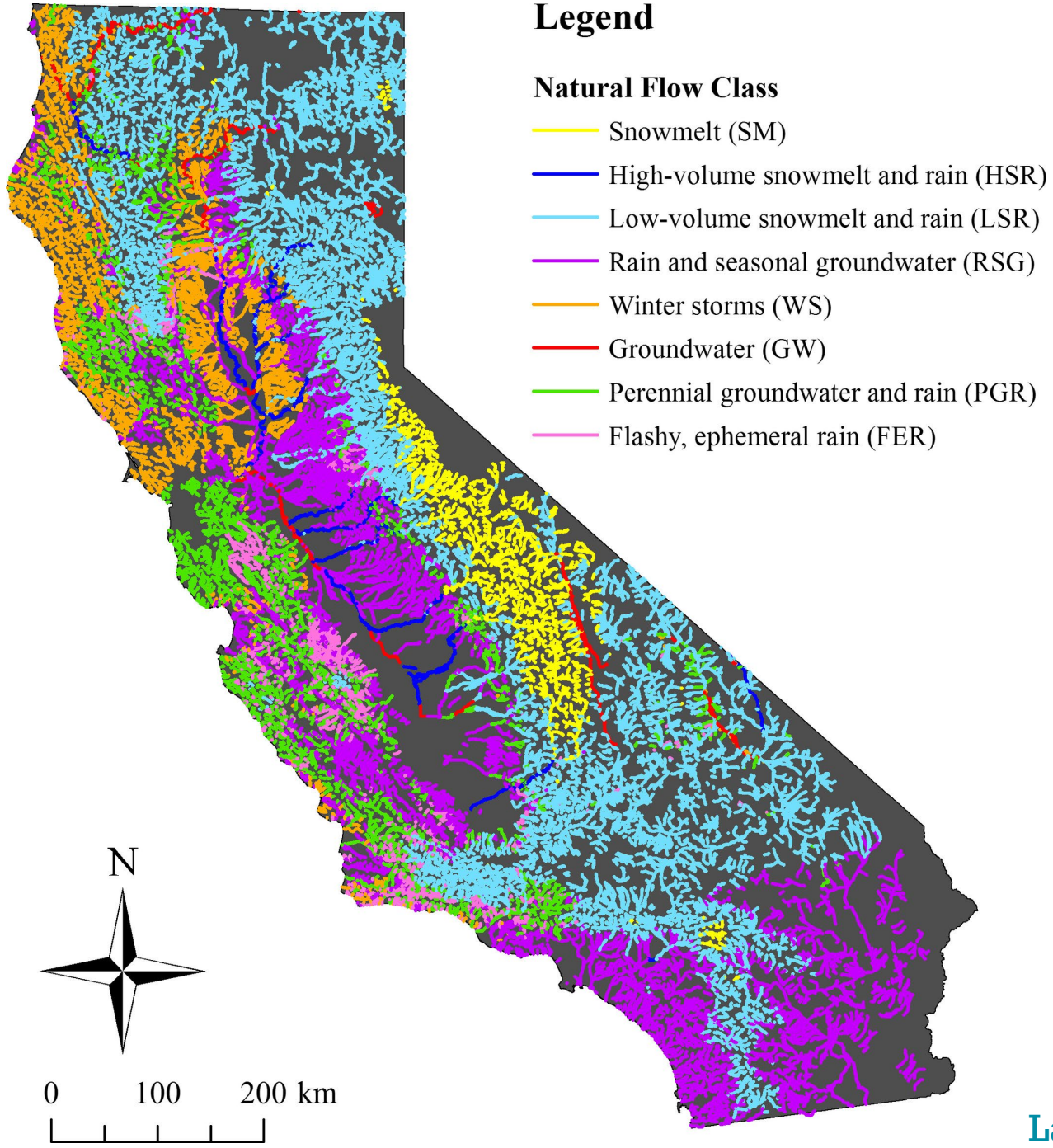
South Fork Tuolumne River (Photo: Ann Willis)

Why rivers?

AMERICAN RIVERS


Major Rivers of California
About 800 mi (1290 km) across)
River
Dry streambed
Lake/reservoir
Dry lake
Source: Wikimedia Commons
Pacific Ocean
Smith
Klamath
Scott
Shasta
Salmon
Upper Klamath Lake
Lost
Tule Lake
Clear Lake Res.
Goose Lake
Redwood Cr.
New
Trinity Lake
Trinity
McCloud
Pit
Shasta Lake
Mad
S.F. Trinity
Whiskeytown Lake
Cottonwood Cr.
Eagle Lake
Susan
Lake Almanor
Honey Lake (dry)
Mattole
Eel
S.F. Eel
M.F. Eel
Mill Cr.
Butte Cr.
N.F. Feather
M.F. Feather
Black Butte Lake
Stony Cr.
Sacramento
Feather
Lake Oroville
N. Yuba
Yuba
Bullards Bar Res.
Noyo
Navarro
Russian
Clear Lake
Cache Cr.
Putah Cr.
American
S.F. American
Folsom Lake
Cosumnes
Napa
Lake Berryessa
Mokelumne
Calaveras
Stanislaus
New Melones L.
Tuolumne
Lake Don Pedro
L. McClure
Merced
Chowchilla
Fresno
San Joaquin
Millerton Lake
Kings
Pine Flat Lake
Pyramid Lake
Truckee
Lake Tahoe
Carson
Walker
Walker Lake
E. Walker
Mono Lake
Lake Crowley
Owens
Owens Lake (dry)
Amargosa
Alameda
San Joaquin
Pajaro
San Luis Res.
San Lorenzo
San Benito
Fresno Slough
Salinas
San Antonio
Nacimiento
Lake Nacimiento
Estrella
Kaweah
L. Kaweah
Tule
Lake Success
Tulare Lakebed
S.F. Kern
Kern
Lake Isabella
Buena Vista Lake (dry)
Twitchell Res.
Cuyama
Santa Maria
Sisquoc
Santa Ynez
Lake Cachuma
Santa Clara
Mojave
San Gabriel
Santa Ana
Whitewater
San Jacinto
Lake Elsinore
Los Angeles
Santa Margarita
San Luis Rey
San Diego
Salton Sea
Alamo
New
Tijuana
Lake Mead
Lake Mohave
Lake Havasu
Colorado

Image source: Robert Szucs, Grasshopper Geography



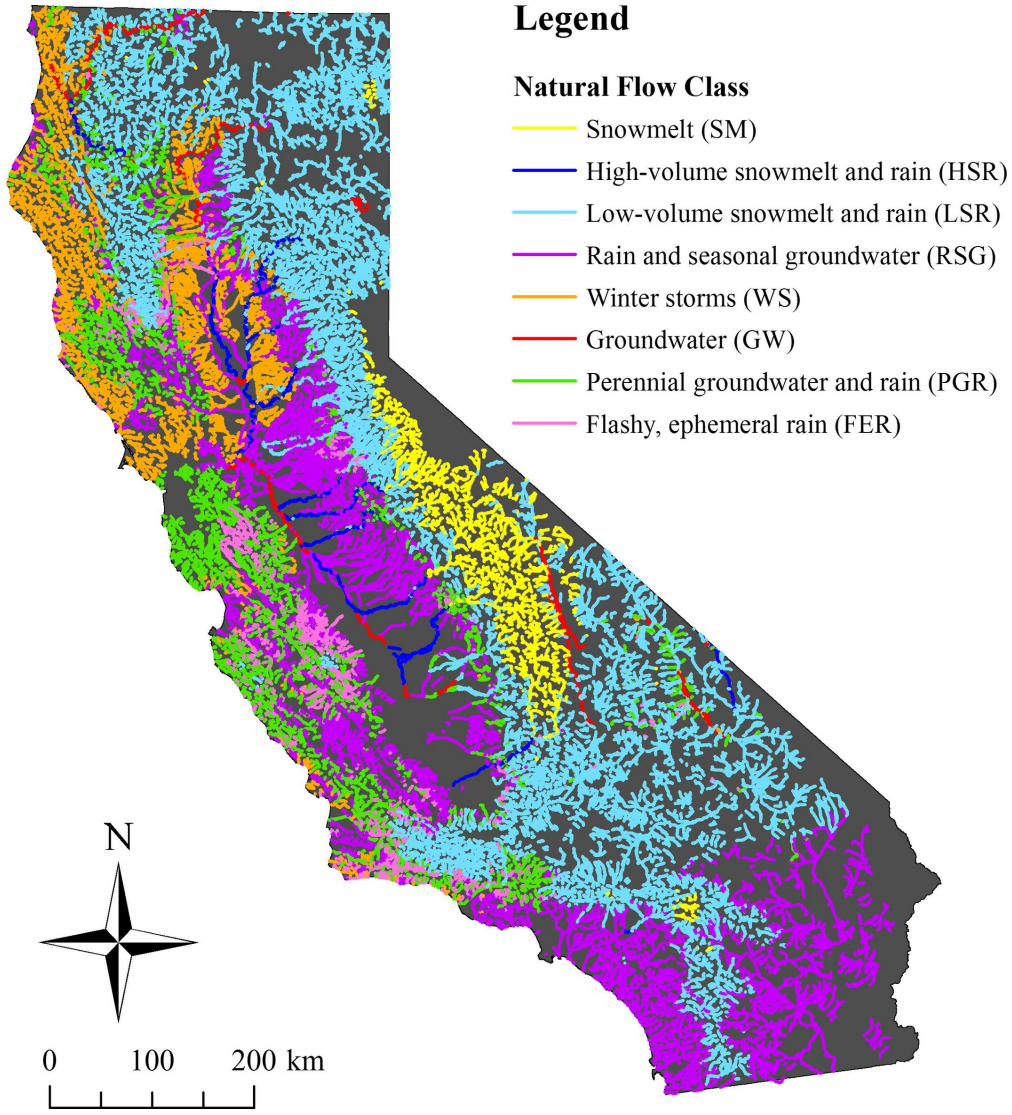
Lane et al. (2017)

Different flows form different river communities

National Park Service, Mud Canyon Road

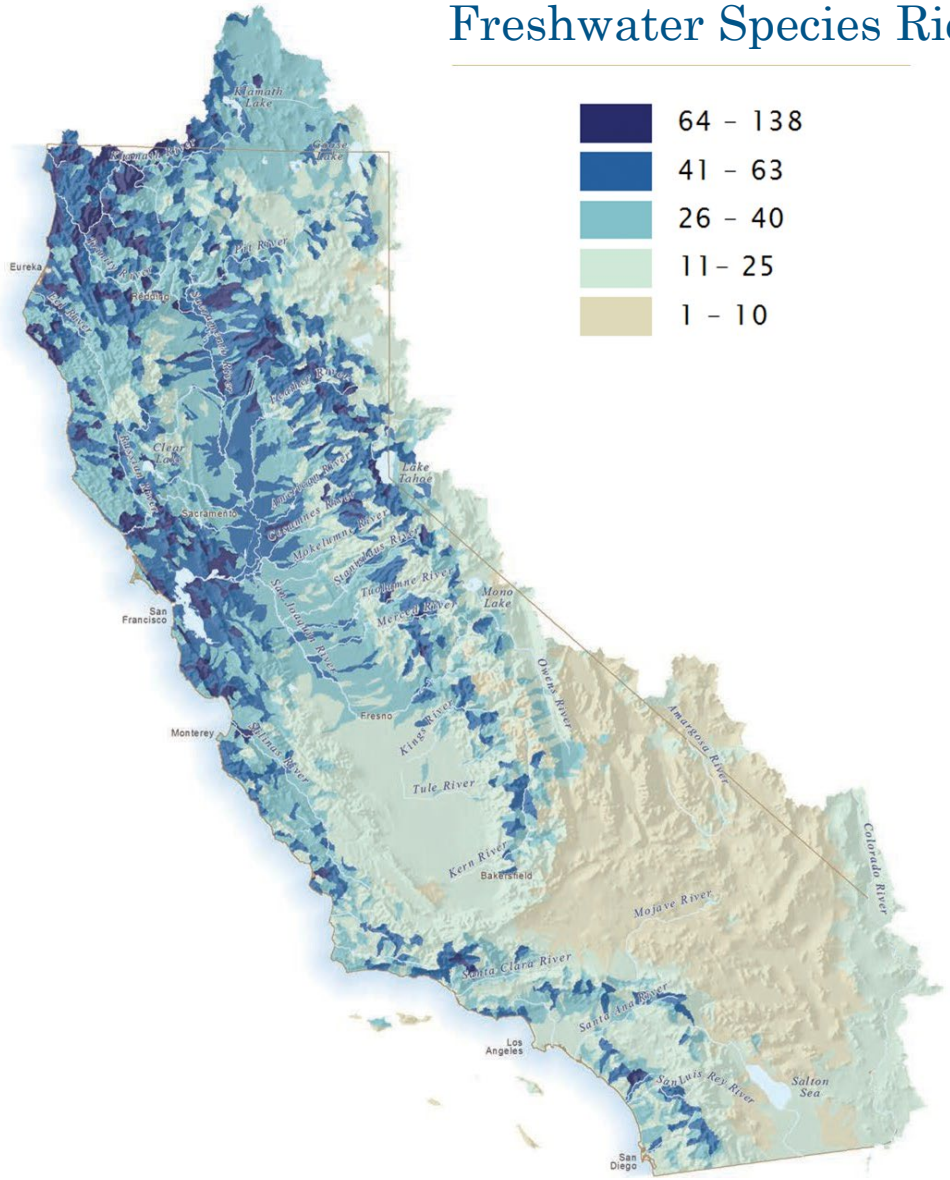
Maiya Greenwood, South Yuba River

Ann Willis, Big Springs Creek

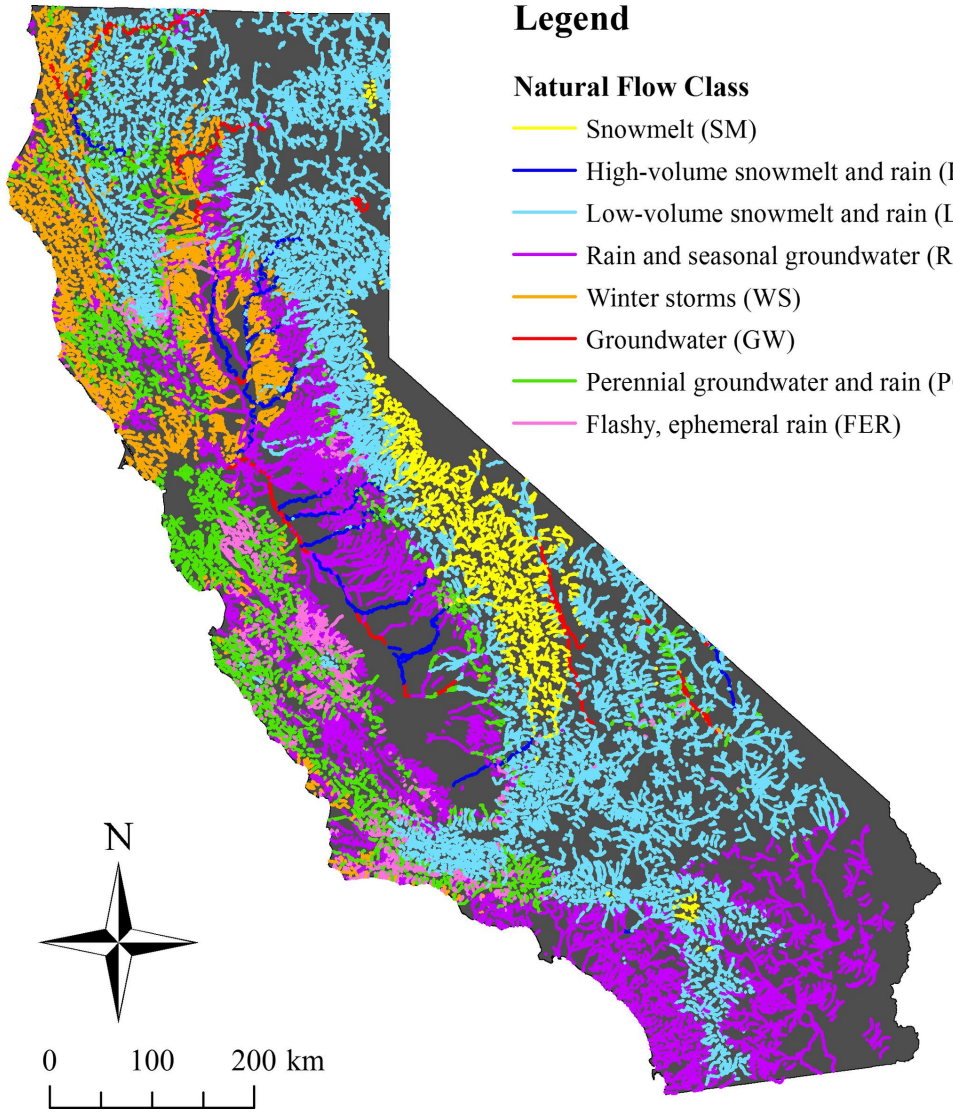


Lane et al. (2017)

Freshwater Species Richness

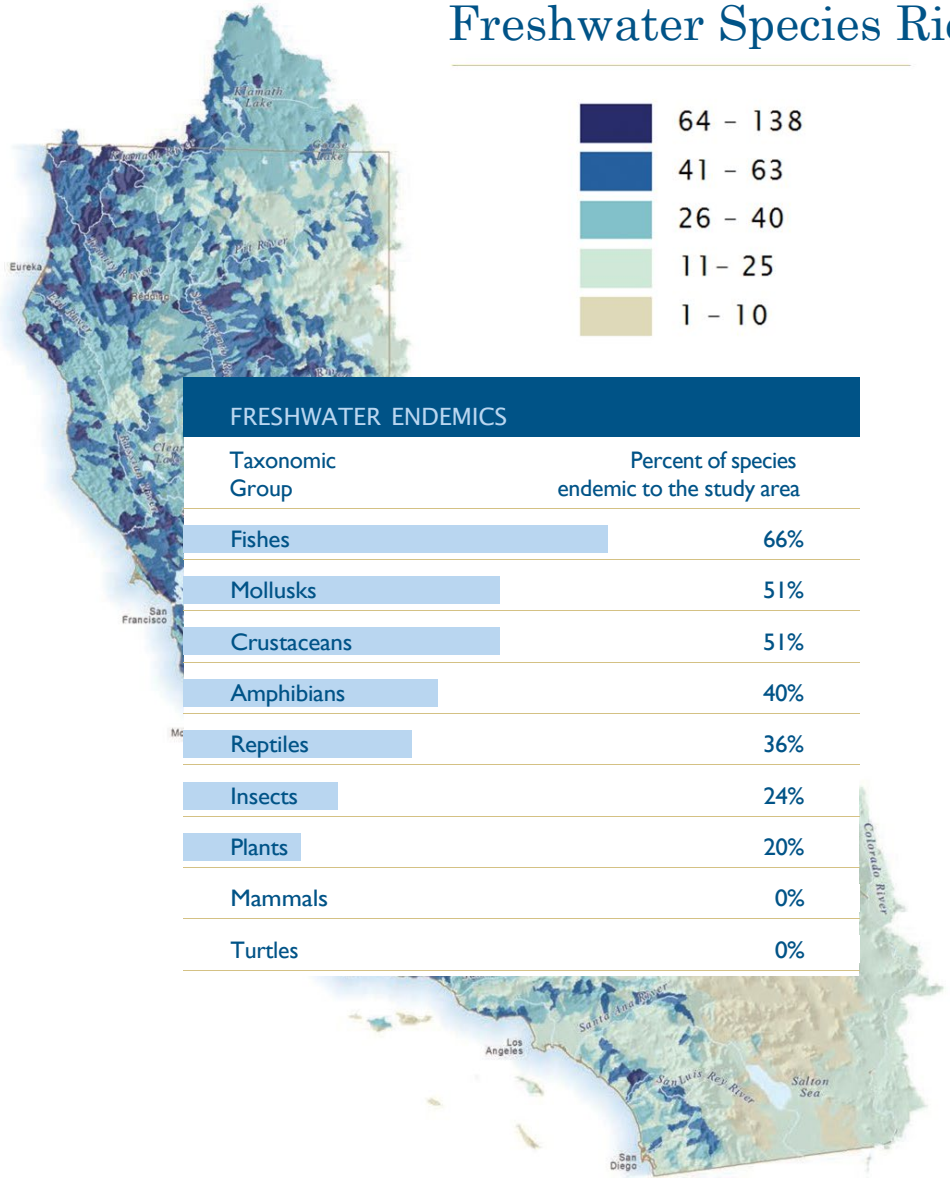


Source: The Nature Conservancy



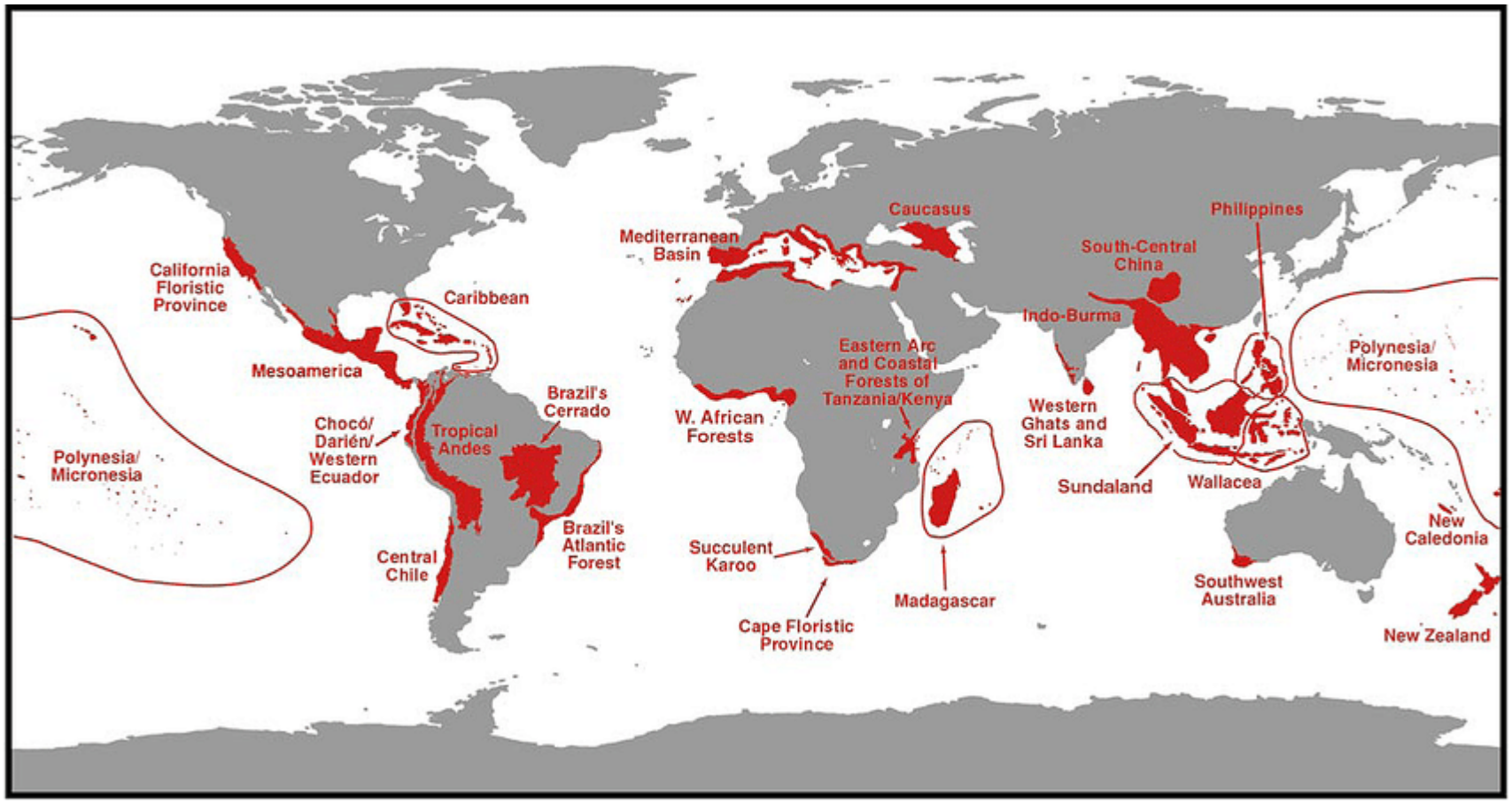
Lane et al. (2017)

Freshwater Species Richness



FRESHWATER ENDEMICS	
Taxonomic Group	Percent of species endemic to the study area
Fishes	66%
Mollusks	51%
Crustaceans	51%
Amphibians	40%
Reptiles	36%
Insects	24%
Plants	20%
Mammals	0%
Turtles	0%

Source: The Nature Conservancy



Myers et al. (2000)

California is a global biodiversity hotspot

Science and conservation: Jim Sedell, PhD

"…fish were part of larger aquatic communities and that effective conservation meant understanding how various parts interacted."

Bisson, P., Reeves, G. and Gregory, S. (2012)

Image source: Ellen Sedell

River Research and Applications

Research Article

WATER TEMPERATURE PATTERNS BELOW LARGE GROUNDWATER SPRINGS: MANAGEMENT IMPLICATIONS FOR COHO SALMON IN THE SHASTA RIVER, CALIFORNIA

A. L. Nichols ✉, A. D. Willis, C. A. Jeffres, M. L. Deas

First published: 02 April 2013 | https://doi.org/10.1002/rra.2655 | Citations: 28

Eye in the Sky: Using UAV Imagery of Seasonal Riverine Canopy Growth to Model Water Temperature

by Ann Willis * and Eric Holmes

University of California, Davis Center for Watershed Sciences, Davis, CA 95616, USA

* Author to whom correspondence should be addressed.

Hydrology **2019**, *6*(1), 6; https://doi.org/10.3390/hydrology6010006

Submission received: 30 November 2018 / Revised: 24 December 2018 / Accepted: 4 January 2019 / Published: 9 January 2019

(This article belongs to the Special Issue Water Quality Monitoring in Streams, Rivers, Lakes and Reservoirs: Novel Methods and Applications)

Article

Oversummer growth and survival of juvenile coho salmon (*Oncorhynchus kisutch*) across a natural gradient of stream water temperature and prey availability: an in situ enclosure experiment

Authors: Robert A. Lusardi ✉, Bruce G. Hammock, Carson A. Jeffres, Randy A. Dahlgren, and Joseph D. Kiernan | AUTHORS INFO & AFFILIATIONS

Publication: Canadian Journal of Fisheries and Aquatic Sciences • 30 July 2019 • https://doi.org/10.1139/cjfas-2018-0484

Hydrological Processes

RESEARCH ARTICLE

Seasonal macrophyte growth constrains extent, but improves quality, of cold-water habitat in a spring-fed river

Andrew L. Nichols, Robert A. Lusardi, Ann D. Willis ✉

First published: 18 December 2019 | https://doi.org/10.1002/hyp.13684 | Citations: 3

Funding information: The Collins Foundation; California Trout; Collins Foundation; the Nature Conservancy, Grant/Award Number: 04212015-2193

Seasonal aquatic macrophytes reduce water temperatures via a riverine canopy in a spring-fed stream

A. D. Willis, A. L. Nichols, E. J. Holmes, C. A. Jeffres, A. C. Fowler, C. A. Babcock, and M. L. Deas

River Research and Applications

RESEARCH ARTICLE

Stream macrophytes increase invertebrate production and fish habitat utilization in a California stream

Robert A. Lusardi ✉, Carson A. Jeffres, Peter B. Moyle

First published: 31 July 2018 | https://doi.org/10.1002/rra.3331 | Citations: 28

MANAGEMENT BRIEF

When Good Fish Make Bad Decisions: Coho Salmon in an Ecological Trap

Carson Jeffres & Peter Moyle

Pages 87-92 | Received 10 Mar 2011, Accepted 11 Oct 2011, Published online: 29 Feb 2012

Cite this article https://doi.org/10.1080/02755947.2012.661389

Science and communication: Katharine Hayhoe, PhD

"The single most important thing that anyone – not just me, but literally anyone – can do to bring people together is, ironically, the very thing we fear most. *Talk about it.*"

Katharine Hayhoe in Saving Us: A Climate Scientist's Case for Hope and Healing in a Divided World

Image credit: Brigham Young University

Climate change

Biodiversity at risk

California has the most imperiled biodiversity of any state in the contiguous United States

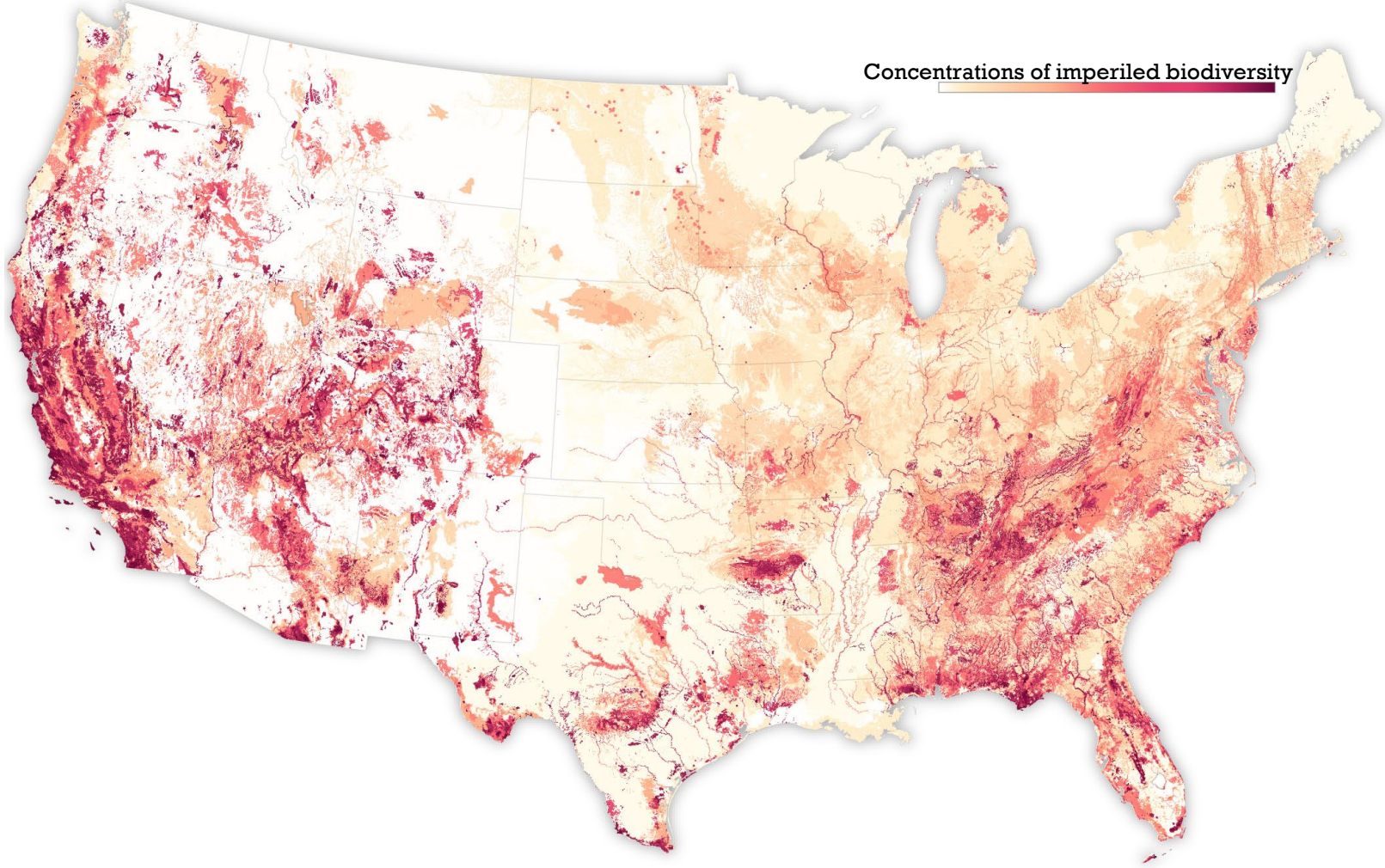


Image source: The New York Times

Racial injustice

Science and policy: Kaveh Madani, PhD

Analysis

Every breath you take: the environmental consequences of Iran sanctions

Nazanin Soroush and Kaveh Madani for Tehran Bureau

Imperial College lecturer Kaveh Madani's TEDx talk gets international attention

By Maryam Qarehgozlou

No waste: Want a change? start with yourself

March 10, 2018 - 9:37 Society

Image credit: Handout (via the Guardian)

Science and policy: Kaveh Madani, PhD

Analysis

Every breath you take: the environmental consequenc sanctions

Nazanin Soroush and Kaveh
Tehran Bureau

Top scientist leaves Iran after crackdown on environmentalists

Kaveh Madani had been seen as symbol of Rouhani government's attempt to reverse brain drain

Image credit: Handout (via the Guardian)

Imperial College lecturer Kaveh Madani's TEDx talk gets international attention

By Maryam Qarehg
No waste
March 10, 2018 - 9:37
Society

March 22, 2024

CALIFORNIA GLOBE

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Home > Articles > Who Is Behind The Removal Of The Four Klamath Dams?

Klamath river California. (Photo: Public Domain)

Who is Behind the Removal of the Four Klamath Dams?

'The nonprofit American Rivers is a board member of the Klamath River Renewal Corporation'

By Katy Grimes, March 13, 2024 12:27 pm

It is not difficult to conclude what this California Globe reader did:

"I had an ugly thought reading this, so I did some checking, which made my suspicions stronger. Removing these dams, in the way it was done, just destroyed the economies, property values, and water supplies of the most reliably conservative communities in California. Areas of the state that went overwhelmingly for Trump in 2016 and 2020. Right before the 2024 general election. Make of it what you will."

PLOS ONE

OPEN ACCESS PEER-REVIEWED

RESEARCH ARTICLE

Classifying California's stream thermal regimes for cold-water conservation

Ann D. Willis, Ryan A. Peek, Andrew L. Rypel

Published: August 20, 2021 • https://doi.org/10.1371/journal.pone.0256286

Article | Authors | Metrics | Comments | Media Coverage | Peer Review

Accessible Data

See the data

This article includes the Accessible Data icon, an experimental feature to encourage data sharing and reuse. Find out how research articles qualify for this feature.

Correction

26 May 2022: Willis AD, Peek RA, Rypel AL (2022) Correction: Classifying California's stream thermal regimes for cold-water conservation. PLOS ONE 17(5): e0269293. https://doi.org/10.1371/journal.pone.0269293 | View correction

Abstract

Stream temperature science and management is rapidly shifting from single-metric driven approaches to multi-metric, thermal regime characterizations of streamscapes. Given considerable investments in recovery of cold-water fisheries (e.g., Pacific salmon and other declining native species), understanding where cold water is likely to persist, and how cold-water thermal regimes vary, is critical for conservation. California's unique position at the southern end of cold-water ecosystems in the northern hemisphere, variable geography and hydrology, and extensive flow regulation requires a systematic approach to thermal regime classification. We used publicly available, long-term (> 8 years) stream temperature data from 77 sites across California to model their thermal regimes, calculate three temperature metrics, and use the metrics to classify each regime with an agglomerative nesting algorithm. Then, we assessed the variation in each class and considered underlying physical or anthropogenic factors that could explain differences between classes. Finally, we considered how different classes might fit existing criteria for cool- or cold-water thermal regimes, and how those differences complicate efforts to manage stream temperature through regulation. Our results demonstrate that cool- and cold-water thermal regimes vary spatially across California. Several salient findings emerge from this study. Groundwater-dominated streams are a ubiquitous, but as yet, poorly explored class of thermal regimes. Further, flow regulation below dams imposes serial discontinuities, including artificial thermal regimes on downstream ecosystems. Finally, and contrary to what is often assumed, California reservoirs do not contain sufficient cold-water storage to replicate desirable, reach-scale thermal regimes. While barriers to cold-water conservation are considerable and the trajectory of cold-water species towards extinction is dire, protecting reaches that demonstrate resilience to climate warming remains worthwhile.

Figures

"The biggest challenge we face isn't science denial. It's a combination of tribalism, complacency, and fear."

Katharine Hayhoe, Saving Us

Burney Falls, Burney Creek (Photo: Ann Willis)

Taking Action With Science

AMERICAN RIVERS

GRETA GERWIG'S 'BARBIE' BREAKS RECORD WITH $155MM OPENING WEEKEND

AMERICAN RIVERS' 'NORTH STAR' PROTECTS 1M MILES OF RIVER BY 2030

Image credit: Wayne Tilcock


Remove 30,000 dams
by 2050
Photo: Jason Hartwick/Swiftwater Films

Image credit: Mike Davis

Image credit: Robb Hirsch

Reconnect and restore 30,000 acres of floodplains by 2050

Protect 10,000 miles through hydropower reform

Thomas O'Keefe, Skagit River, WA

Thomas O'Keefe, Skagit River, WA

Science for policy

- S.B. 1521 Community and Hydropower Improvement Act
- S.B. 3045 Ackerson Meadow Land Swap
- H.R. 3700 Northwest California Wilderness, Recreation, and Working Forests Act
- H.R. 5104 National Dam Safety Reauthorization Act

Building a movement through storytelling

Life Depends on Rivers℠

AMERICAN RIVERS